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Development of emergency medicine in Rwanda

Développement de la médecine d'urgence au Rwanda

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KEYWORDS

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Abstract Rwanda, known as the "Land of a Thousand Hills," is a small, East African country that was the site of the devastating 1994 genocide. In the past 18 years, this post-conflict country has made tremendous progress in rebuilding itself and its health infrastructure. The country has recovered or surpassed many of its pre-1994 health levels, including reduction in HIV/AIDS prevalence, under-five mortality and road traffic accidents. Nevertheless, Rwanda continues to face a high burden of disease. The leading causes of mortality in Rwanda include complications of HIV/AIDS and related opportunistic infections, severe malaria, pulmonary infections, and trauma, and are best managed with emergency and acute care services. However, health care personal resources remain significantly lacking, and there is currently no emergency medicine-trained workforce.

The Rwandan government, partnering with international organizations, has launched a campaign to improve human resources for health, and as a part of that effort the creation of training programs in emergency medicine is now underway. The Rwandan Human Resources for Health program can serve as a guide to the development of similar programs within other African countries. The emergency medicine component of this program includes two tracks: a 2-year postgraduate diploma course, followed by a 3-year Masters of Medicine in Emergency Medicine. The program is slated to graduate its first cohort of trained Emergency Physicians in 2017.

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Abstract Le Rwanda, également appelé ''Pays des mille collines'', est un petit pays d'Afrique de l'Est qui a été le théâtre d'un génocide dévastateur en 1994. Au cours des 18 dernières années, ce pays en sortir de conflit a réalisé des progrès formidables pour se reconstruire et reconstruire ses infrastructures de santé. Le pays s'est relevé et a dépassé bon nombre de ses niveaux sanitaires antérieurs à 1994, et est notamment parvenu à réduire la prévalence du VIH/Sida, la mortalité des enfants de moins de cinq ans et les accidents de la route. Le Rwanda reste néanmoins aux prises avec un lourd fardeau de maladies. Les principales causes de mortalité dans le pays sont les complications du VIH/Sida et les infections opportunistes associées, le paludisme grave, les infections pulmonaires et les traumatismes, dont la gestion est aux mieux assurée par des services de soins d'urgence et de soins aigus. Les ressources en personnel de santé continuent cependant à faire défaut, et il n'existe actuellement pas de maind'oeuvre formée à la médecine d'urgence.
Le gouvernement rwandais, en partenariat avec des organisations internationales, a lancé une campagne visant à améliorer les ressources humaines destinées à la santé, et la création de programmes de formation à la médecine d'urgence est actuellement en cours dans le cadre de cet effort. Le programme Human Resources for Health rwandais peut servir de guide au développement de programmes similaires dans d'autres pays d'Afrique. La composante médecine d'urgence de ce programme se décompose en deux parties : un diplôme de troisième cycle de deux ans, suivi d'un Master de médecine en médecine d'urgence sur trois ans. Le programme devrait voir ses premiers diplômés en médecine d'urgence en 2017.

African relevance

- Rwanda is developing a sustainable emergency medicine training program.
- Development of Rwanda's emergency medicine program can help guide other countries.
- International collaboration has helped drive the development of the specialty.
- Limitations in resources have influenced the development of this training program.

What's new?

- The development of an emergency medicine program is now underway in Rwanda.
- The Rwandan Ministry of Health is driving and coordinating this process.
- The training program offers post-graduate certification for General Practitioners.
- The program provides a four-year training course for emergency medicine physicians.

Introduction

Rwanda is a small, landlocked country in East Africa, bordered by Burundi, Democratic Republic of the Congo, Tanzania, and Uganda. The country is approximately 26,338 km^2, with an estimated at 10.4 million people.[1] With a population density of 368 inhabitants/km^2, Rwanda is the most densely populated country in Africa.[2] Moreover, the population is young, with 42.3% of all Rwandans under the age of 15 and the annual population growth rate is currently estimated at 2.6%. If these figures remain unchanged, the population is expected to reach 16 million inhabitants in 2020.[3] Geographically, Rwanda is comprised of three distinct regions; mountainous and volcanic highlands in the north and west, a central plateau dominated by rolling hills which give the country its moniker (''Land of a Thousand Hills''), and gradually flattening lowlands to the east. Politically, Rwanda is divided into five provinces, as shown in Fig. 1. The provinces are subdivided into 30 districts, 416 sectors, 2148 cells, and 14,837 villages (*Umudugudu*).[4]

In 1994, Rwanda suffered from a genocide and war that left more than 1,000,000 people dead and much of the country destroyed. Following the destruction of the genocide, a mass exodus of Rwandans further decimated the country's fragile economic base, and severely impoverished the population. However, following the cessation of hostilities, Rwanda has made substantial progress in rehabilitating itself economically and socially. In fact, Rwanda is now one of the most noted examples of fast economic growth and successful post-war reconstruction. The GDP has demonstrated an average annual growth of 7–8% since 2003 and inflation has been reduced to single digits.[5]

Despite over a decade of remarkable progress, Rwanda remains a low-income country as classified by the World Bank.[6] With a real GDP per capita of 520 USD, Rwanda is among the poorest countries in the world, ranking 166 of 187 in the United Nations Human Development Index.[7] Over 60% of the population lives below the poverty line and 41% of that group lives in extreme poverty.[8] Indeed, the majority of the population engages in subsistence agriculture for food production, which, despite Rwanda's fertile ecosystem, often does not keep pace with need.[8]

Health status

The most recent health indicators show improvement in several important metrics over the past decade, notably reduction of maternal and neonatal tetanus and malaria-related mortal-

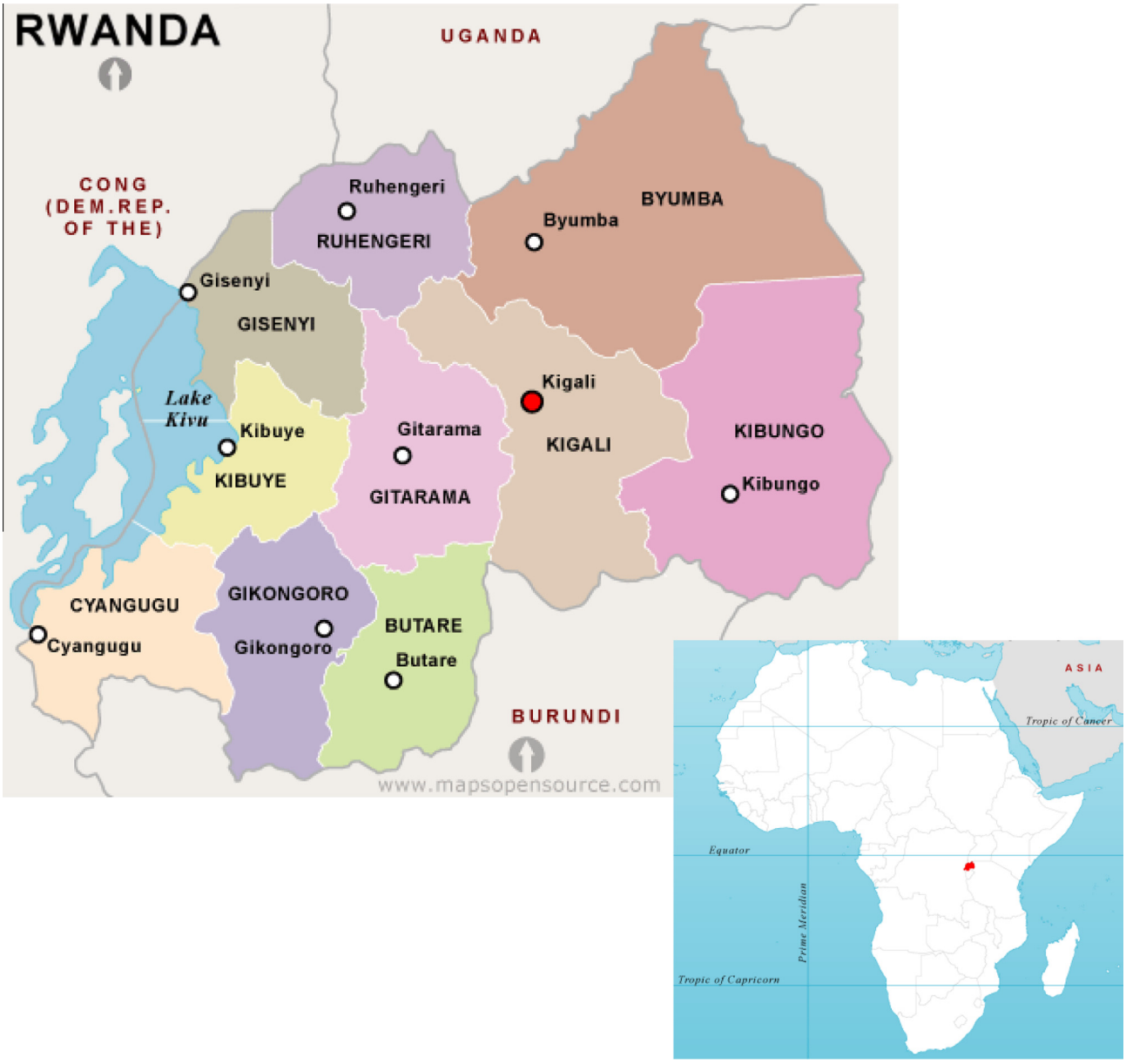

Fig. 1 Map of Rwanda. Source: http://www.mapsopensource.com.

ity. Maternal mortality and under-five mortality have also steadily declined.[9] At 2.9%,[2] the HIV prevalence is low compared to many African countries, while the anti-retroviral (ARV) coverage for those with CD4 counts below 350 is quite high at 77%.[10] The average life expectancy in Rwanda has risen over the past decade and is currently 58 years, greater than the regional average.[11] While these statistics reveal an impressive improvement in the health of Rwandans, and are favorable when compared to African regional averages, the health of Rwandans remains deeply affected by disease and poverty. The distribution of the burden of disease in Rwanda continues to reflect many regional trends. Communicable diseases, such as malaria, HIV and AIDS, acute respiratory infections, diarrheal diseases and tuberculosis constitute 90% of chief complaints in health facilities (Fig. 2).[8] Non-communicable diseases such as hypertension, diabetes, breast cancer and cervical cancer are increasing public health problems, but their scope is not fully known. Mortality and morbidity from these illnesses are aggravated by the high level of poverty, low level of education of the population, as well as problems relating to inadequate water, hygiene and lack of adequate sanitation systems.[3]

The leading causes of mortality in Rwandan hospitals include HIV/AIDS and related opportunistic infections, severe malaria, and pulmonary infections. Non-communicable diseases, such as cancer and cardiovascular disease, as well as death due to injury are significant causes of mortality as well (Fig. 3). Though Rwanda has launched several successful initiatives at preventing road traffic accidents, accidental injury or death from road traffic accidents continues to plague the country.[12] In addition, the region is exposed to many natural disasters such as volcanic eruption and floods, as well as

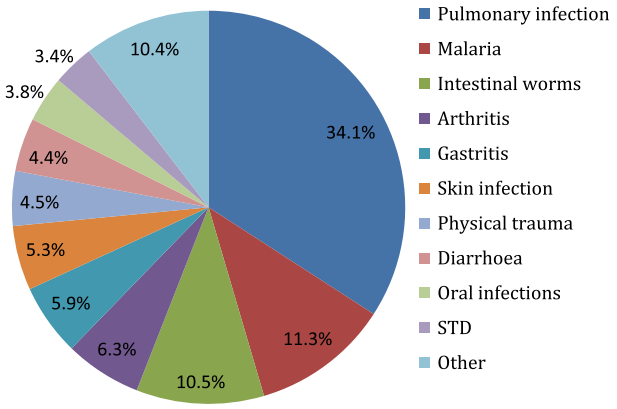

Fig. 2 Outpatient consultations 2008, by disease (Total consultations: 5,491,789).

man-made disasters such as conflicts and wars, leading to massive population displacements.

Health services

Rwanda's Total Health Expenditure (THE) has risen to 10.5% of GDP, which is relatively high compared to the global mean, and significantly higher than most countries in the African Region. Despite this impressive figure, the annual per capita health spending is only 40 USD, roughly half of the regional average.[13] As the latest National Health Accounts report (2006), donor funds remain the largest contributor to THE (53%). Private (household) spending has grown over the past decade and represents 28% of THE. Whereas donor money tends to target programs for disease, household spending is spent on curative services and pharmaceuticals. Finally, government spending represents 19% of THE.[14] Since the 1994 genocide decimated the country's health infrastructure, efforts are now underway to remedy this enduring resource gap. In its *2011 Human Resources for Health Strategic Plan*, the Ministry of Health (MoH) adopted a strategic five-year plan for 2011–2016 to guarantee the availability of appropriate numbers and combinations of qualified health personnel at all levels of the health system.[8] The strategic plan involves four core elements: (1) decentralization, (2) development of primary health care (including the provision of health insurance for all, *mutellede la sante*), (3) reinforcement of community participation, and (4) rebuilding the health workforce.[4]

Currently, the majority of Rwandan physicians are general practitioners (GPs), a term indicating that they did not complete a post-graduate training program in a medical specialty. Most GPs work in the public sector, oftentimes in district hospitals. Despite having its own medical and nursing school, the heath care workforce shortage in Rwanda is arresting; the population ratio is 1 doctor for each 15,306 population number, a physician density of 0.047 physicians per 1000 inhabitants (Table 1).[8]

Emergency care provision in Rwanda

Emergency medicine (EM) is one of the fastest growing medical specialties worldwide, now recognized in over 70 low, middle, and high-income countries. Emergency physicians generally work at the hospital level, providing initial triage and stabilization for patients with a wide variety of medical, surgical, and traumatic conditions at all times of the day and night. In most countries, emergency physicians also provide supervision and direction for pre-hospital emergency medical services (EMS) systems, as well as help coordinate disaster and emergency response at the local and national level. The recent rapid growth of EM as a specialty, especially in low and middle-income countries, may be attributed to increasing the understanding of the importance of providing timely acute care in order to effectively reduce death and disability. Overall, seven of the top 15 causes of morbidity and mortality worldwide can likely be reduced through the provision of high-quality, cost-effective emergency care.[15]

Currently in Rwanda, emergency medical services are provided by health professionals with little formal training in emergency care. At the district hospital level, emergency

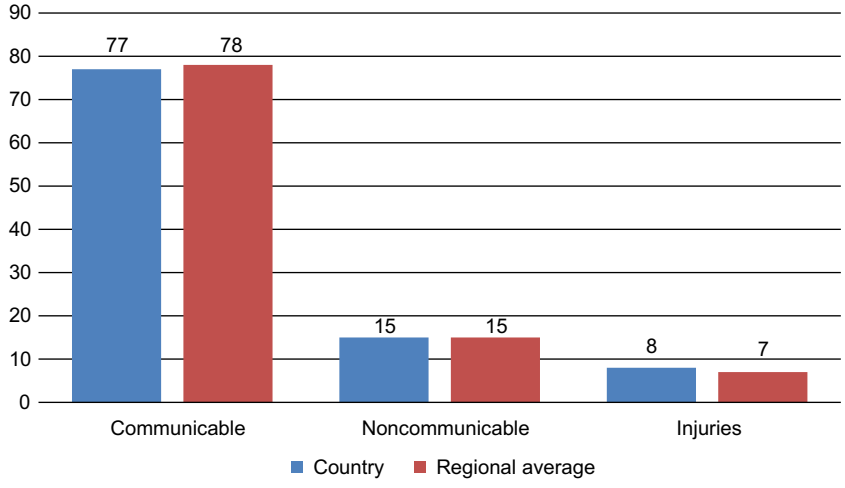

Fig. 3 Distribution of Life lost by cause, Rwanda and regional averages. Source: World Health Organization Country Health Profile (Data refers to 2008).

Table 1 Health worker density in Rwanda (2002). Source: Rwanda Ministry of Health, Annual Report 2008.

Health care worker	Total number in Rwanda	Density per 1000 Rwanda	Density per 1000 African
Physicians	401	0.047	0.217
Nurses and midwives	3647	0.430	1.172
Dentists and technicians	21	0.002	0.035
Pharmacists and technicians	278	0.033	0.063
Public health workers	101	0.012	0.049

departments are largely absent, and no formal means exist for triaging patients who arrive with potentially life threatening medical and surgical conditions. Although data suggests that infrastructure for the delivery of emergency care in Rwanda has come a long way, several key challenges remain, including need for specialized EM training, and the integration of pre-hospital care.

Development of the emergency medicine training program

Through the Human Resources for Health (HRH) initiative, Rwanda is establishing the first large scale, sustainable, health workforce-training program in the country. The initiative is supported by a large Grant from USAID and the Global Fund to Fight AIDS, Tuberculosis, and Malaria and involves a consortium of 17 US medical schools, nursing schools and public health schools working closely with the Rwanda MoH. This massive initiative will help Rwanda to train advanced nursing, public health and medical personnel to fill its large human resource gap in the health sector. In addition, six new Masters of Medicine programs, akin to residency programs in the US or registrarships in the UK, have been created. These multi-year training programs will produce physician-specialists in emergency medicine, internal medicine, surgery, anesthesia, obstetrics and gynecology, and pediatrics.

As part of the HRH strategic plan, the MoH brought together an Emergency Medicine Sub-Committee composed of US-based emergency physicians and local Rwandan physicians of various disciplines to conduct a needs assessment and examine the feasibility of developing an emergency medicine training course in Rwanda. The committee found a strong interest in emergency medicine among Rwandan medical students and physicians, as well as a strong interest among Rwandan hospitals to improve the delivery of emergency care at their institutions. The new training program, however, would have to fill two distinct needs: (1) Rapidly scaling up the capacity of general practitioners working at the district hospitals to triage and stabilize emergency cases; and (2) Creating a sustainable supply of EM faculty to train future generations of physicians, supervise the pre-hospital care system, and aid the MoH in disaster and emergency planning at the local and national levels. As such, the Emergency Medicine Sub-Committee decided to create a two-tiered training system. The first tier consists of a 2-year, part-time post graduate diploma (PGD) course in Emergency and Critical Care Medicine, aimed at training 1–2 GPs currently working at each of the 30 rural district hospitals in the fundamentals of emergency care. The second tier, which will recruit a smaller number of high-performing graduates from the PGD course, will be a Masters of Medicine in Emergency Medicine, structured similarly to US-based emergency medicine residency programs. Both of these programs will initially draw heavily upon the skills of expatriate emergency medicine faculty and upon local Rwandan faculty with specialty training in other related disciplines until they can be replaced by fully trained Rwandan emergency physicians.

Post-graduate diploma course

Admission to the new PGD course in Emergency and Critical Care Medicine is currently open to persons who hold a degree in general medicine (MBChB), pass an entrance exam, and gain a recommendation from the director of their district hospital. As part of this program, students rotate back and forth between fulfilling their national service obligation at the rural district hospitals and completing their emergency medicine training at one of the national referral hospitals located in Kigali or Butare. About half of their rotations over the two-year course are in emergency medicine, while the remainder of the clinical rotations is dedicated to exposing students to various specialties that are relevant to emergency practice, with a specific emphasis on critical care medicine (Table 2).

The PGD course will begin enrolling in the fall of 2012, and is expected to matriculate 15 post-graduate students in its first class. Approximately 10 of these students will continue to work at the district hospital level after they graduate, likely staffing the emergency and triage areas of their hospital, while five students in each cohort will be selected to continue in the full-time Masters of Medicine in Emergency Medicine.

Masters in Medicine

Beginning in 2014, five graduates of the PGD course will continue their studies each year in the Masters of Medicine in Emergency Medicine, eventually becoming the first fully trained emergency physicians in Rwanda. The residency curriculum will consist of a three-year, full time course of study beyond the initial PGD course, composed of both month-long rotations and several longitudinal elements. In addition to clinical rotations and didactics, the program will incorporate simulation-based training as well as ultrasound training. Students will also have an opportunity to developing their academic medicine skills through teaching and a thesis project. Clinical rotations will be based at the University Teaching Hospital of Kigali [CHUK] and Centre Hospitalier Universitaire de Butare [CHUB], as well as the King Faisal Hospital in Kigali.

At this rate of training, the Rwanda MoH expects that by 2017 it will graduate its first class of five emergency physicians. In addition, by this time there will have been over 40 general practitioners who have completed the PGD course in Emergency and Critical Care Medicine working at the various district hospitals across the country. By 2019, there will be enough newly minted Rwandan Emergency Physicians to begin

Table 2 Proposed curriculum. Source: Ministry of Health, Human Resources for Health Strategic Plan 2011–2016.

Post-graduate diploma course, year 1	Post-graduate diploma course, year 2	Masters in Medicine: first year	Masters in Medicine: second year	Masters in Medicine: third year
Emergency medicine (4)	Emergency medicine (2)	Emergency medicine (6)	Emergency medicine (6)	Emergency medicine (6)
General Surgery (1)	Obstetrics/Gyn (1)	Pediatric ICU (KFH) (1)	Neonatal ICU (KFH) (1)	Teaching/Admin (1)
Anesthesia (1)	Critical care (1)	Medical ICU (KFH) (1)	Pediatric EM (1)	Provincial/district hospital rotation (2)
Annual leave (1)	Orthopedics/ pediatric EM (1)	Pediatric EM (1)	Foreign EM rotation (3)	Pediatric EM (1)
	Annual leave (1)	Ultrasound (1)EMS/ Ambulance Service (1) Annual leave (1)	Annual leave (1)	Thesis Presentation (1) Annual leave (1)

phasing out the US EM faculty, as the Rwandan emergency physicians take over as faculty for both the PGD course and the Masters of Medicine. These same Rwandan emergency physicians will also have the skills and knowledge to aid the MoH in continuing to shape the structure of pre-hospital and hospital-based emergency care in the country, as well as national disaster planning efforts.

Development of pre-hospital emergency care

There is a rapidly growing pre-hospital emergency medical services (EMS) system in Rwanda; 51 ambulances were purchased and 370 motorcycles were distributed to the health centers. SAMU (Service d'Aide médicale d'Urgence) was launched in 2009 to provide emergency support for accident victims and the seriously ill.

Development of emergency nursing care

Historically, there have been three levels of training for nurses in Rwanda; A2, A1, and A0. A2 level nurses are trained to the secondary school level. A1 nurses possess an advanced certificate in nursing obtained after 3 years of nursing school. A0 nurses possess a bachelor's degree in nursing. Currently, A1 nurses represent less than 10% of the total pool of nurses. On average there is approximately 1 nurse per 1500 Rwandans. The Rwandan MOH has outlined a plan for strengthening nursing education, faculty development, and professionalization of Rwandan nursing in its HRH Strategy. The primary focus of this initiative is to support nursing faculty in Rwanda and strengthen clinical teaching programs for nursing students. As part of this program, nursing educators and clinical mentors from several international universities will work with Rwandan Schools of Nursing and teaching facilities to develop nursing education. Clinical mentors are being recruited with expertise in a number of clinical specialties, including, pediatrics (including neo-natal intensive care), midwifery, mental health nursing, adult nursing (including critical care, trauma and surgery, infectious diseases and infection control), and public health and community nursing. At this time there are not explicit plans to develop emergency care nursing specialists, though there are efforts under way to provide additional training for general practice nurses working in the emergency departments of the main referral hospitals.

The future of emergency medicine in Rwanda

After the establishment of the first emergency medicine training programs in the country, the next step will be the establishment of an Emergency Medicine Association for Rwanda, which can collaborate with similar organizations in neighboring countries such as Tanzania, as well as the African Federation for Emergency Medicine and the International Federation for Emergency Medicine. In addition, there will be the need to gain formal recognition for the specialty of emergency medicine from the Rwanda Medical Council, while also establishing a Department of Emergency Medicine at the National University of Rwanda. Finally, there will also be a need for the establishment of training programs for pre-hospital emergency medical service workers, as well as the establishment of indigenous programs of emergency medicine research.

This is indeed an exciting time for the development of emergency medicine in Rwanda. The Rwandan MoH, working in collaboration with US institutions, has laid the groundwork for two sophisticated and complementary EM training programs to fit the needs of the country. The programs are designed to provide a sustainable source of locally trained physicians that will work with the countries newly launched EMS system to provide emergency and acute care for a population with great need. Challenges and limitations encountered will affect the EM training programs in ways relevant to other African countries facing similar constraints.

Conflict of interest

Though none of the authors have a personal conflict of interest to report, the Department of Emergency Medicine at the Brown University, where both Drs. Levine and George work, has received funding from the Government of Rwanda as part of the Human Resources for Health Strengthening Plan.

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for their contribution to emergency medicine development in Rwanda and to this paper.

Appendix Short. Answer Questions

Test your understanding of the contents of this article (answers can be found at the end of the regular features section)

1. In Rwanda, current barriers to emergency care provision include the following:
   a. Lack of trained Emergency Physicians to staff emergency departments.
   b. Few district hospitals with designated emergency departments.
   c. Lack of ambulances at the district hospital level.
   d. a and b.
   e. all of the above.

2. In Rwanda, the governmental initiative that supports and funds the emergency medicine training program is known as:
   a. The Rwandan Emergency Medicine Commission.
   b. The Human Resources for Health Strategic Plan.
   c. The African Emergency Medicine Foundation.
   d. The USAID Health Work Force Program.

3. The Rwandan EM training program will offer two training tracks, including:
   a. A Masters of Medicine in Emergency Medicine track and an Emergency Medicine/Critical Care Diploma track.
   b. A Masters in Medicine track and a Masters in Public Health track.
   c. An Emergency Medicine/Critical Care Diploma track and a Public Health track.
   d. A Diploma in Critical Medicine Track and a Masters in Critical Medicine track.

Answers: (1) d, (2) b, (3) a.

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